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(54) Vehicle door separable for access to door hardware.

(57) The door inner and outer panels (22,24) are detachably attached to one another to permit separation to access the space therebetween containing the door hardware (30,32,34). A hinge device (82,84) mounts the door inner panel and the door outer panel on the vehicle body (10) for independent hinging movement so that the door inner and outer panels move between door open and door closed position in unison with one another when the door inner and outer panels are attached, and the detachment of the door inner and outer panels from one another permits the door outer panel to swing away from the door inner panel to provide unobstructed access to the door hardware mounted in the space between the door inner and outer panels. The door inner and outer panels may be constructed of moulded plastic and with one panel having a receptacle (108,110) receiving a door guard beam (106) and the other panel having an integral moulded structure (112) receiving the receptacle upon attach-

ment of the door inner and outer panels together so that the door guard beam becomes effectively coupled with both of the door inner and outer panels. Integrally moulded innerlocks (100,102) are preferably provided on the moulded door inner and outer panels to mate with one another when the door inner and outer panels are attached together. Attachment of the door inner and outer panels is provided by a plurality of fasteners which extend between the integrally moulded innerlock features.

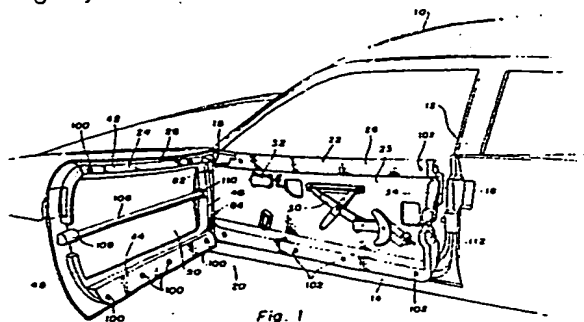


Fig. 1

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## VEHICLE DOOR SEPARABLE FOR ACCESS TO DOOR HARDWARE

The invention relates to a vehicle door and more particularly provides door inner and outer panels hinged separately on the vehicle body so that the door inner and outer panels can be pivotally separated to facilitate access to door hardware mounted inside the vehicle door.

Motor vehicle doors typically comprise door inner and outer panels which are joined together and define a space therebetween for housing door hardware such as the window regulator and door latch. The door inner panel conventionally has one or more openings through which the door hardware may be installed and repaired. After the door hardware is installed, a decorative trim panel is attached to the door inner panel to conceal the inner workings of the vehicle door.

In order to service the vehicle door, the decorative trim panel must be removed and the repair person reaches through the access openings to diagnose and repair the door hardware. The door structure typically includes a door guard beam which extends longitudinally inside the vehicle door and may complicate the installation and repair of the door hardware.

The door inner and outer panels may be constructed of stamped sheet metal or moulded plastic, or a combination thereof.

It would be desirable to provide a vehicle door construction providing improved access to the door hardware mounted inside the vehicle door.

To this end, a vehicle door in accordance with the present invention is characterised by the features specified in the characterising portion of Claim 1.

According to the invention the door inner panel and the door outer panel are detachably attached to one another so that the door inner and outer panels may be separated to facilitate access to the space therebetween containing the door hardware. A hinge device mounts the door inner panel and the door outer panel on the vehicle body for independent hinging movement so that the door inner and outer panels move between door open and door closed position in unison with one another when they are attached, and the detachment of the door inner and outer panels from one another permits the door outer panel to swing away from the door inner panel and provide unobstructed access to the door hardware mounted in the space between the door inner and outer panels. The door inner and outer panels may be constructed of moulded plastic, with one panel having a receptacle receiving the door guard beam and the other panel having an integral moulded structure receiving the receptacle upon attachment of the door

inner and outer panels together so that the door guard beam becomes effectively coupled with both of the panels. Integrally moulded innerlocks are preferably provided on the moulded door inner and outer panels to, mate with one another when the door inner and outer panels are attached together. Attachment of the door inner and outer panels is preferably provided by a plurality of fasteners which extend between the integrally moulded innerlock features.

Accordingly, the objects, features, and advantages of the invention resides in a vehicle door construction in which the door inner and outer door panels are detachably separable from one another and yet hinged for independent movement relative one another so that detaching of the door inner and outer panels and relative hinging movement relative therebetween opens the space between the panels to facilitate installation maintenance of the door hardware located therein.

Another object, feature and advantage of the invention resides in a vehicle door comprised of moulded plastic door inner and outer panels with one of the panels having an integrally moulded receptacle receiving a door guard beam which becomes captured between the two panels when the door inner and outer panels are attached together.

The present invention will now be described, by way of example, with reference to the following description of a preferred embodiment and the appended drawings, in which:-

Figure 1 is a perspective view of a vehicle body having a vehicle door according to the present invention and shown with the door outer panel separated from the door inner panel and hingedly moved to an open position facilitating access to the door hardware mounted inside the vehicle door;

Figure 2 is an exploded view showing the door inner panel and the door outer panel having hinge elements for hingedly mounting the door inner and outer panels relative one another;

Figure 3 is a perspective view showing the hinge arrangement hingedly mounting the door inner and outer panels on the vehicle body; and

Figure 4 is a sectional elevation view showing a typical fastener separably connecting the door inner panel and outer panel.

Referring to Figure 1, there is shown a vehicle body generally indicated at 10 and having a door opening 12 defined in part by a rocker panel structure 14, a hinge pillar 16 at the forward end of the door opening and a latch pillar 18 at the rearward end of the door opening. A vehicle door 20 for

selectively opening and closing the door opening 12 is comprised of a door inner panel 22 and a door outer panel 24. The door inner panel 22 is constructed of moulded plastic, preferably by reaction injection moulding or sheet moulding compound. The door inner panel 22 is comprised of a generally planar central portion 23 surrounded by a peripheral flange structure 26 extending around the top, bottom and hinge pillar margins of the planar central portion 23. Peripheral flange structure 26 gives the door inner panel 22 a substantial rigidity strength. As seen in Figure 1, door hardware, such as the window regulator mechanism 30, door latch release handle 32, and the door latch 34 are mounted on the outside surface of the door inner panel 22.

The door outer panel 24, as best seen in Figure 2, is comprised of two separately moulded plastic parts. A reinforcement member 28 is generally rectangular ring in configuration including an upper flange structure 42, lower flange structure 44, a forward flange structure 46, and a rearward flange structure 48. The door outer panel 24 also includes a outer skin member 50 of moulded plastic which is adhesively or otherwise bonded to the reinforcement member 28 and defines the outer surface of the vehicle door 20.

The door inner panel 22 and door outer panel 24 are each hingedly mounted on the hinge pillar 16. As best seen in Figure 2, the door inner panel 22 carries an upper hinge bracket 52 and a lower hinge bracket 54. The upper hinge bracket 52 is a sheet metal stamping attached to the door inner panel 22 by bolts 55 and 56 and includes an upper hinge arm 58 and a lower hinge arm 60 vertically spaced from one another. The upper hinge arm 58 and lower hinge arm 60 have coaxially aligned pivot apertures 62 and 64 provided therein. The lower hinge bracket 54 is similarly constructed.

The door outer panel 24 carries an upper hinge bracket 68 and a lower hinge bracket 70. The upper hinge bracket 68 is integrally moulded with the reinforcement member 28 and includes an upper hinge arm 72 and a lower hinge arm 74 which respectively have aligned pivot apertures 76 and 78. The lower hinge bracket 70 of the door outer panel 24 is similarly configured. The upper and lower hinge arms 72 and 74 are vertically spaced apart although to a lesser dimension than the vertical spacing between the upper and lower hinge arms 58 and 60 of the upper hinge bracket 52 so that the upper hinge bracket 68 of the door outer panel 24 may be tightly nested within the upper hinge bracket 52 of the door inner panel 22.

The door inner panel 22 and door outer panel 24 are mounted on the hinge pillar 16 by an upper hinge bracket 82 and lower hinge bracket 84 carried by the hinge pillar 16. As best shown in Figure

3, the upper hinge bracket 82 includes an upper hinge arm 86, and also a lower hinge arm 88, not shown. The upper and lower hinge arms 86 and 88 are shown in Figure 2. The upper and lower hinge arms 86 and 88 of the upper hinge bracket 82 are vertically spaced from one another at a greater vertical spacing than the upper and lower hinge arms 58 and 60 of the upper hinge bracket 52 so that the upper and lower hinge arms 86 and 88 will closely capture the inner hinge bracket 52. Furthermore, the upper and lower hinge arms 86 and 88 have pivot pin apertures 90 and 92 which align with the pivot pin apertures of the upper hinge brackets 52 and 68. Accordingly, as best seen in Figure 3, the installation of a hinge pivot pin 96 through the aligned apertures of the upper hinge bracket 82, the upper hinge bracket 52, and the upper hinge bracket 68, will mount the door inner and outer panels 22,24 for hinging movement on the vehicle body 10. The upper and lower hinge brackets 52,54,68,70,82,84 define hinge means for the vehicle door 20.

Referring to Figure 1, it is seen that the door outer panel 24 is hinged open away from the door inner panel 22 to expose the window regulator mechanism 30, door latch assembly and the door latch 34 for installation and/or maintenance. The hinges enable the door outer panel 24 to be pivoted inwardly to closely overlie the door inner panel 22. Detachable attachments are provided to connect the door inner panel 22 and the door outer panel 24. As seen in Figures 1 and 2, the reinforcement member 28 of the door outer panel 24 includes a plurality of integrally moulded conical projections 100 which are aligned to mate and engage into a plurality of conical depressions 102 integrally moulded in the peripheral flange structure 26 of the door inner panel 22. When the door outer panel 24 is swung into overlying engagement with the door inner panel 22, the conical projections 100 extend in close fitting interlocking relationship with the conical depressions 102 of the door inner panel to substantially rigidify and strengthen the vehicle door 20. The door inner panel 22 and door outer panel 24 are attached together by a plurality of fasteners, preferably threaded screws 104, which are installed from inside the car, through the conical depressions 102 and into the conical projections 100 of the door outer panel 24 as shown in Figure 4. After these threaded screws 104 are installed, a decorative trim panel is attached to the inside of the vehicle door 20. These threaded screws 104 may be removed in order to permit a repairman to access and repair the door hardware simply by swinging the door outer panel 24 outwardly to the position of Figure 1 thereby exposing the door hardware to convenient access.

Referring again to Figure 1, it is seen that the

door outer panel 24 carries a door guard beam 106. The door guard beam 106 is a structural member of metal or reinforced plastic construction such as a tube. As best seen in Figure 1, receptacles 108 and 110 are integrally moulded into the forward flange structure 46 and rearward flange structure 48 of the reinforcement member 28 to conveniently capture the door guard beam 106 on the reinforcement member 28. Furthermore, as seen in Figure 1, the door inner panel 22 has an integrally moulded cylindrical depression 112 in the peripheral flange structure 26 which is aligned with the receptacle 108 to closely capture and receive the receptacle 108 therein. Thus, when the door outer panel 24 is swung to its normal position engaging the door inner panel 22, the door guard beam 106 becomes effectively coupled with both the door outer panel 24 and the door inner panel 22.

Thus it is seen that the invention provides a new and improved vehicle door construction which particularly enhances access to the door hardware contained inside the vehicle door 20 for both vehicle original equipment assembly and aftermarket repairs. By simply removing the plurality of threaded screws 104, the door outer panel 24 is swung away from the door inner panel 22 exposing the door mounted hardware. It will be understood that the door mounted hardware may be mounted on either the door inside panel or the door outside panel. Furthermore, it will be understood that the construction of this invention is particularly suited to moulded plastic door inner and outer panels but may be equally applied to door inner and outer panels of stamped metal construction.

## Claims

1. A vehicle door (20) adapted for hinged mounting upon a vehicle body (10) and carrying door hardware such as a window regulator (30) and door latch (34), comprising: a door inner panel (22); a door outer panel (24) adapted for attachment upon the door inner panel (22) in overlying relationship therewith to define a space therebetween for the door hardware; and hinge means (52,54,68,70,82,84) mounting the door inner panel (22) and the door outer panel (24) on the vehicle body (10), said hinge means mounting the door inner and outer panels (22,24) for unitary movement between door open and door closed positions when the door inner and outer panels are attached; characterised in that the door inner panel (22) and the door outer panel (24) are adapted for detachment and separation from one another to permit access to the door hardware; and in that the hinge means (52,54,68,70,82,84) also mounts the door

outer panel (24) for opening movement relative to the door inner panel (22) when the door outer panel (24) is detached from the door inner panel (22) whereby access is provided to the door hardware.

2. A vehicle door as claimed in Claim 1, comprising attaching means (104) detachably attaching the door inner and outer panels (22,24) together for enabling detachment and separation of one of the panels from the other.

3. A vehicle door as claimed in claim 2, wherein the door inner panel (22) and the door outer panel (24) each have a plurality of integrally formed interlocking features (100,102) arranged in mating relation with each other to establish the door inner and outer panels in force transmitting connection with one another to provide a stable door construction.

4. A vehicle door as claimed in claim 3, wherein the attaching means (104) comprises a plurality of fasteners installed between the integrally formed interlocking features (100,102) of the door inner panel (22) and door outer panel (24).

5. A vehicle door as claimed in any one of claims 1 to 4, wherein the door hardware is mounted on one of the panels (22) and a door guard beam (106) is carried by the other panel (24) so that the hinged separation of the panels upon detachment from one another carries the door guard beam (106) away from the door hardware to facilitate access to the door hardware.

6. A vehicle door as claimed in any one of claims 1 to 5, wherein the hinge means comprises a hinge bracket (82,84) mounted on the vehicle body (10) and providing a hinge axis for hinged mounting the vehicle door (20) on the vehicle body (10); a hinge bracket (52,54) associated with the door inner panel (22) and hinged mounting the door inner panel (22) on the hinge bracket (82,84) on the vehicle body (10) for pivotal movement about the hinge axis; and a hinge bracket (68,70) associated with the door outer panel (24) and hinged mounting the door outer panel (24) on the hinge bracket (82,84) on the vehicle body (10) for pivotal movement about the hinge axis.

7. A vehicle door as claimed in any one of claims 1 to 6, wherein the door inner panel (22) is of moulded plastic; the door outer panel (24) includes a moulded plastic reinforcement member (28) covered by a moulded plastic outer skin member (50); one (22) of the panels has a receptacle (108,110) moulded therein for receiving and mounting a door guard beam (106) on the one panel, the receptacle projecting toward the other panel (24); and the other panel (24) has an integrally moulded structure (112) for receiving the receptacle (108,110) of the one panel (22) so that the door guard beam (106) becomes effectively coupled

with both of the panels (22,24) when the door inner  
and outer panels are attached together.

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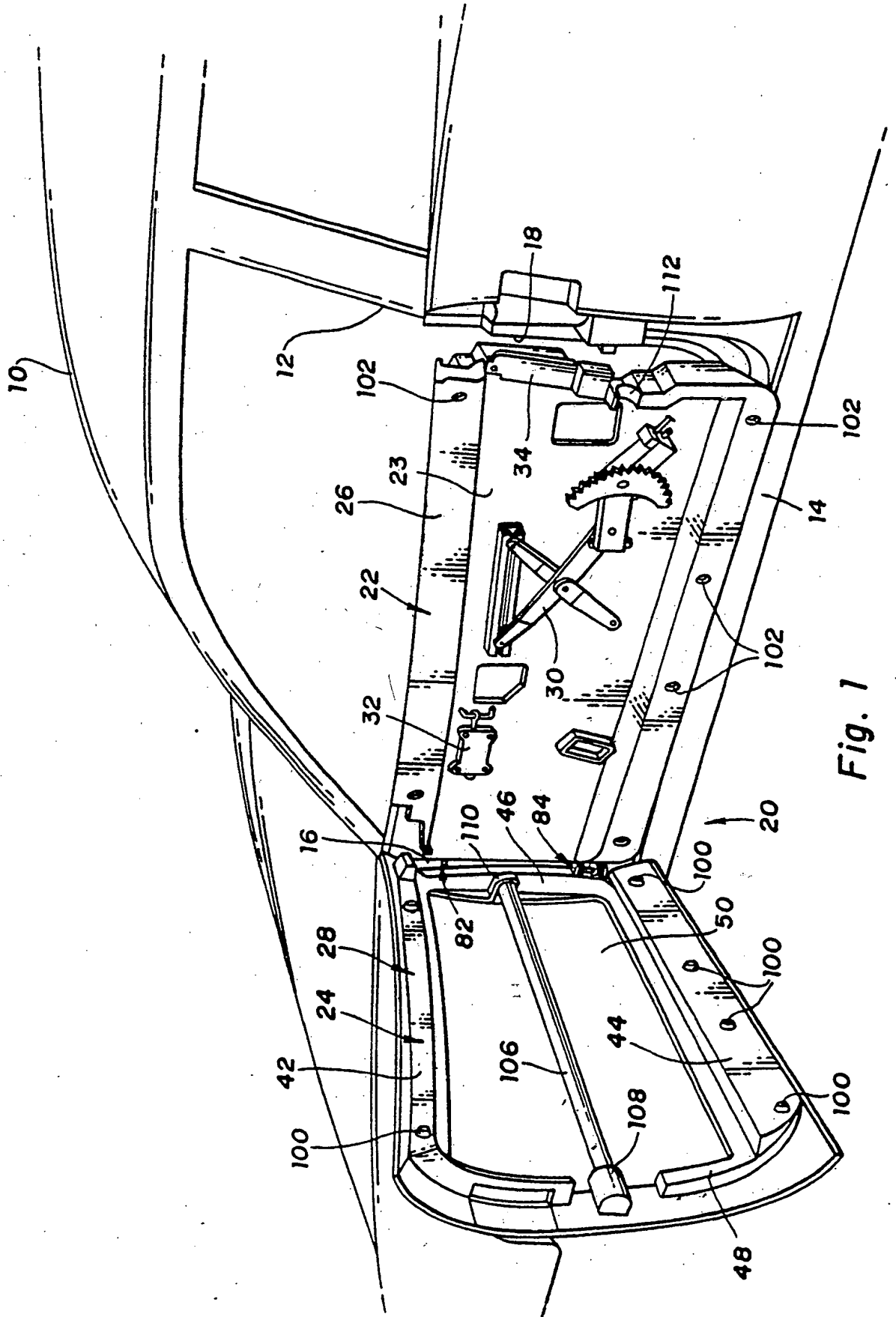
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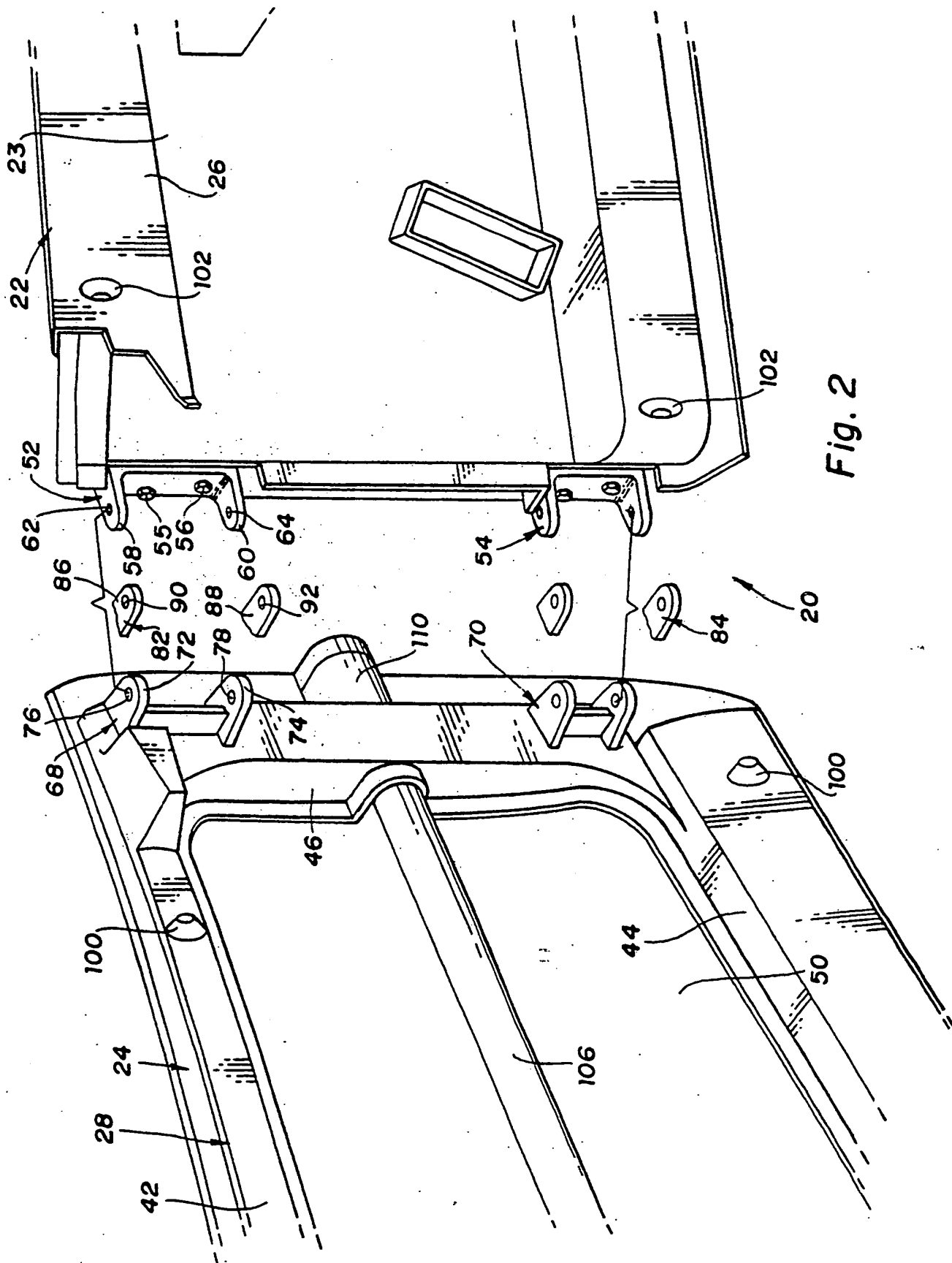


Fig. 2

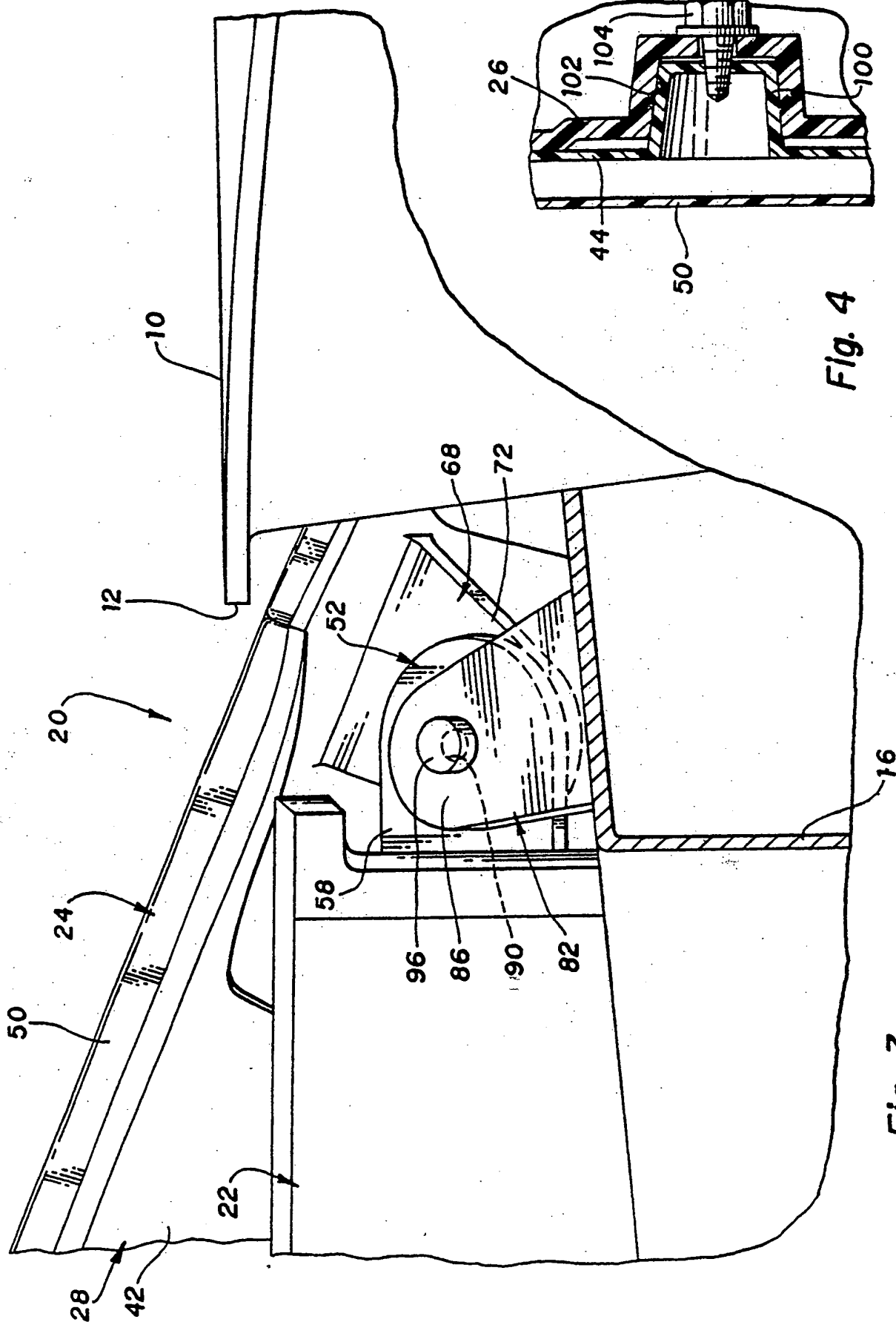


Fig. 3

Fig. 4

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54 Vehicle door separable for access to door hardware.

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that the door guard beam becomes effectively coupled with both of the door inner and outer panels. Integrally moulded innerlocks (100,102) are preferably provided on the moulded door inner and outer panels to mate with one another when the door inner and outer panels are attached together. Attachment of the door inner and outer panels is provided by a plurality of fasteners which extend between the integrally moulded innerlock features.

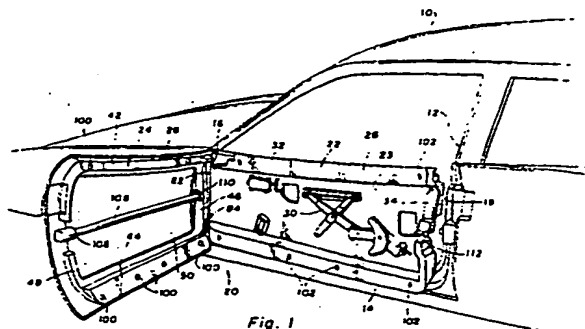


Fig. 1

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European Patent  
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# EUROPEAN SEARCH REPORT

Application Number

EP 89 30 2310

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	EP-A-0 170 150 (FIAT) * Whole document *	1,2,6	B 60 J 5/04
A	-----	4,7	
A	EP-A-0 145 306 (FORD) * Page 7, lines 1-4; figures 1,2 * -----	1,5	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			B 60 J
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 05-09-1990	Examiner FOGLIA A.
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